53 (IE 711) FLPC

2014

FLUIDIC POWER AND CONTROL

Paper : IE 711

Full Marks : 100

Pass Marks : 30

Time : Three hours

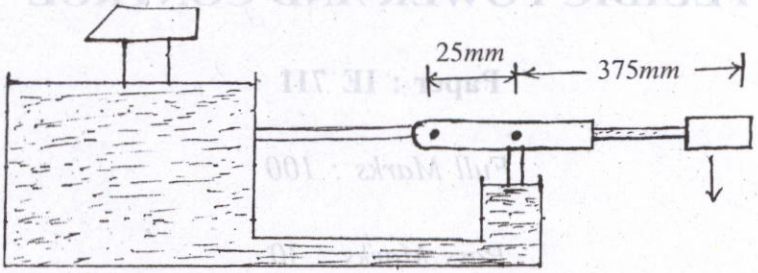
The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* What are the fundamental components of a hydraulic system ? 2

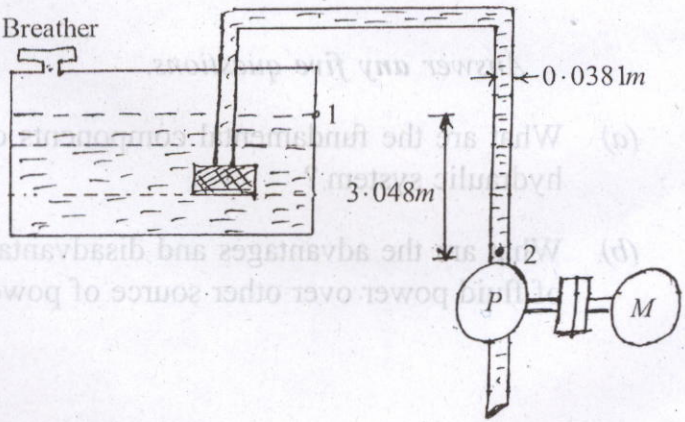
   (b) What are the advantages and disadvantages of fluid power over other source of power ? 4

(c) A hydraulic jack is filled with oil. The large and small pistons have diameter of 50*mm* and 25*mm* respectively. What force will be required to support a load of 8000*N*. If the handle moves down by 100*mm*, how far is the weight lifted ? 8



(d) Derive the equation of pressure difference at two stations across a venturimeter. 6

2. (a)



The pump flow due to a pump is $0 \cdot 001896 m^3/sec$. Air pressure at station 1 in the hydraulic tank is $68 \cdot 97 kPa$ gauze pressure. The inlet line to the pump is $3 \cdot 048 m$ below the oil level. The pipe has an inside diameter $0 \cdot 0381 m$, find the pressure at station 2 if

(i) There is no head loss and

(ii) There is head loss of $7 \cdot 602 m$. 12

(b) The kinematic viscosity of a hydraulic fluid is $0 \cdot 0001 m^2/sec$. If it flows in a $20 mm$ diameter commercial steel pipe, find the friction factor (f) if velocity is $3 m/sec$. 5

(c) A hydraulic pump delivers oil at $25 lpm$ and $5000 kPa$. How much hydraulic power does the pump deliver ? 3

3. *(a)* Determine the actual power required to drive a compressor that delivers $100 scfm$ of air at $100 psig$. The overall efficiency is 75%. 4

(b) Explain the operation of piston compressor. Why dryer and after coolers are used in pneumatic system ? 5+3=8

(c) Describe the working of air filter and air pressure regulator with necessary diagram. 8

4. (a) Describe the operation of lobe pump. A gear pump has 3 inch outside diameter, 2inch inside diameter and 1 inch width. If the actual pump flow is 1500*rpm* and the pressure is 28*gpm*, determine the volumetric efficiency. 4+5=9

(b) Explain the working of swash plate type inline piston pump.

A pump has a displacement volume of $100cm^3$, it delivers $0{\cdot}0015m^3/sec$ at 1000*rpm* and 70*bar*. If the prime mover input torque is 120*Nm*, what is the overall efficiency of the pump. 5+6=11

5. (a) Describe the working of balanced vane motor. 5

(b) A hydraulic motor has a displacement of $10inch^3$ and operate with a pressure of 1000*psi*, speed of 2000*rpm*. If the actual flow rate consumed by the motor is 95*gpm* and the actual torque delivered by the motor is 1500 in.*lb*, find *(i)* η_v *(ii)* η_m and *(iii)* η_o. 7

(c) Describe the operation of four way type and shuttle valve. 5+3=8

6. (a) Explain how simple pressure relief valve works. 5

(b) Derive the expression of output of a pneumatic flapper nozzle proportional controller. 7

(c) Describe the working sequence of a two handed press safety system using *RS* flip flop. 8

7. Write short notes on ***any four*** of the following : 4×5=20

(i) Balanced vane pump

(ii) Screw compressor

(iii) Pneumatic telemetering system

(iv) Solenoid actuated valve

(v) External gear motor.
